Missouri valley.—3d, 4th, 12th, 18th.
Middle slope.—8th, 10th, 11th, 12th, 29th.
North Pacific coast region.—Astoria, Oregon, 4th, 8th, 9th, 17th, 18th, 19th.
South Pacific coast region.—Yuma, Arizona, 3d.

At Austin, Texas, a severe thunder-storm occurred on the night of the 11–12th, during which the University building was struck by lightning and damaged to a considerable extent.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England.—2d, 3d, 10th, 11th, 15th, 16th, 19th, 21st, 22d, 27th.
Middle Atlantic states.—3d, 4th, 6th, 12th, 13th, 16th, 22d, 27th.
South Atlantic states.—1st, 2d, 6th, 8th, 20th, 23d, 26th to 29th.
Tennessee.—2d, 5th, 11th, 12th, 14th, 15th, 18th, 21st, 22d, 26th.
Ohio valley.—1st, 16th, 21st, 26th.
Lower lake region.—1st, 16th, 19th, 21st, 29th.
Upper lake region.—1st, 3d, 5th, 6th, 8th, 10th, 11th, 20th, 21st, 27th, 28th.
Extreme northwest.—5th, 6th, 12th, 15th, 19th.
Upper Mississippi valley.—10th, 15th, 18th to 23d, 25th, 26th, 27th.
Missouri valley.—3d, 6th, 12th, 13th, 15th, 19th to 22d, 25th, 27th.
Middle slope.—15th, 18th, 20th, 29th.
Middle Pacific coast region.—8th, 9th, 10th, 13th, 17th, 19th, 20th, 22d, 24th.

Solar halos were also observed at the following stations not included in the districts named above:

Fort Grant, Arizona, 14th.
Deadwood, Dakota, 6th.
Boisé City, Idaho, 25th.
Nephi, Utah, 27th.
Salt Lake City, Utah, 10th.
Spokane Falls, Washington Territory, 20th.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

New England.—3d, 5th, 7th, 8th, 10th, 14th, 15th, 19th.
Middle Atlantic states.—3d, 5th, 6th, 7th, 10th, 13th, 15th, 16th.
South Atlantic states.—2d, 4th to 8th, 12th.
Florida peninsula.—1st, 6th.
Eastern Gulf states.—7th, 8th, 10th.
Western Gulf states.—1st, 2d, 4th, 15th, 24th.
Rio Grande valley.—5th, 6th, 9th, 19th.
Tennessee.—4th, 5th, 15th, 16th, 22d.
Ohio valley.—1st to 4th, 16th, 19th, 23d, 25th.
Lower lake region.—7th, 10th.
Upper lake region.—2d, 5th, 6th, 7th, 9th, 10th.
Extreme northwest.—5th, 6th, 7th, 9th, 10th, 11th, 14th.
Upper Mississippi valley.—2d, 4th, 5th, 9th, 13th, 20th.
Missouri valley.—1st, 2d, 3d, 6th, 9th, 11th, 12th, 22d.
Northern slope.—1st, 5th, 6th, 8th, 9th.
Middle slope.—2d, 4th, 6th, 9th, 15th; 16th, 18th.
Southern slope.—4th, 8th, 10th.
Middle plateau.—5th, 8th, 12th, 13th.
Northern plateau.—5th, 9th, 10th.
Middle Pacific coast region.—2d, 3d, 4th, 6th, 9th, 10th, 13th.

Lunar halos were also observed at the following stations not included in the districts named above:

Prescott, Arizona, 9th.
Olympia, Washington Territory, 16th.
Port Angeles, Washington Territory, 7th.

MIRAGE.

Fort Maginnis, Montana.—During the afternoon of the 15th many points along the Yellowstone river in the southwest, and not ordinarily visible, were plainly seen. On the 17th, during the afternoon, the whole southern and eastern portions of the country appeared to be elevated above their natural positions.

Mirage was also observed at the following places during the month:

College City, California, 9th, 12th.
Vermillion, Dakota, 9th, 24th.
Alexandria, Dakota, 9th, 24th, 28th.
Saint George's, Delaware, 19th.
Larchland, Illinois, 2d, 14th.
Pretty Prairie, Kansas, 1st, 2d.
Genoa, Nebraska, 9th, 13th, 14th.
Indianola, Texas, 15th, 17th, 25th, 28th.

MISCELLANEOUS PHENOMENA.

The peculiar appearance of the sky at sunrise and sunset, which has been observed for several months past, continued, but with diminished brilliancy, during February. The reports for February are much less numerous than those received during the previous months, and show that the phenomenon is becoming less noticeable, although, in some instances, the displays were reported to have been very brilliant.

The phenomenon was observed in the several states and territories, as follows:

Alabama.—Green Springs, 5th, at sunrise; 21st, at sunset. Auburn, on all clear days of the month.
Arkansas.—Fayetteville, 24th, at sunset.
California.—Hydesville, 3d, 7th, 9th, 13th, 20th, 22d to 27th, at sunrise, and on 2d, 7th, 12th, 12th, 20th, 22d to 28th, at sunset. Point Lobos, 25th, 26th, 27th, at sunset. Cape Mendocino, 23d, 25th, 26th, at sunset.
Colorado.—Golden, 28th, at sunset. On the summit of Pike's Peak on 22d, a dim, red light resembling the sunset glow, appeared in the southwest at 6.30 p. m., and continued for thirty minutes.
Dakota.—Alexandria, 1st, 8th, at sunset, and 9th, 14th, 15th, at sunrise. Vermillion, the sunset after-glow steadily diminished in brilliancy during the month. The observer at Webster reports that the sunsets during February were more noticeable than any previously observed; they were noted on the 1st, 6th to 9th, 19th, 20th, 22d, 24th; those of 6th and 20th, being remarkably brilliant; on the 9th the sky at sunrise was of the same appearance.
Florida.—Archer, 21st at sunrise, and 22d, 23d, and 27th at sunset. Limona, 24th, 29th, sunrise, and 23d at sunset. Newport, 1st, 2d, 4th, 5th, 20th, 21st, 22d, 25th, both before sunrise and after sunset. Jacksonville, 23d, very brilliant both after sunset and before sunrise.
Georgia.—Andersonville, 27th at sunset.
Idaho.—Boisé City, the remarkable redness in the western sky after sunset continued during February.
Illinois.—Cairo, 19th at sunset. Swanwick, bright sunrises and sunsets continued during February.
Indiana.—Vevay, 1st, 2d, 3d, 19th, 29th at sunrise. Sunman, 19th, 21st at sunrise and 20th at sunset.
Iowa.—Muscatine, 2d, 14th, 20th at sunset, and 20th, 21st at sunrise. Cedar Rapids, 14th at sunrise.
Kansas.—Wellington, red sunsets were observed on all clear days of the month, but were not so brilliant as those seen during the previous months. Fort Scott, the red sunsets of February were not so brilliant as those of January.
Maine.—Cornish, 15th, at sunset.
Maryland.—Baltimore, 2d, at sunset.
Massachusetts.—Taunton, 15th, at sunset, very brilliant.
Nebraska.—Clear Creek, 1st, 2d, 7th, 8th, 12th, 13th, 19th, 20th, 22d, at sunset. Red Willow, 27th, 28th, at sunrise.
Nevada.—Carson City, 29th, the red sunsets still continue.
New Hampshire.—Summit of Mount Washington, 10th, 15th, 16th, at sunset, and the 16th at sunrise.
New York.—North Volney, 21st, at sunrise.

North Carolina.—Brevard, 21st, at sunset.
Ohio.—College Hill, 1st, 2d, at both sunrise and sunset.
Oregon.—Albany, 25th, at sunset.
Pennsylvania.—Fallsington, 21st, at sunset.
Tennessee.—Knoxville, at about one hour before sunrise on the 11th, a dense fog prevailed which presented a very peculiar appearance—being of a deep red color which appeared equally brilliant in all directions. Nashville, sunset glows on 1st, 2d. Hardison's Mills, 5th, 12th, 15th, 24th, at sunrise. Manchester, Grief, and Alexandria, on 11th, at sunrise. Hardison's Mills, 4th, 20th, 21st, at sunset. Parksville, Hurricane Switch, Grief, and Alexandria, on the 15th, at sunset.
Texas.—Cleburne, 24th, 25th, at sunrise.
Vermont.—Strafford, 1st, 16th, at sunset, and 17th at sunrise.
Washington Territory.—Bainbridge island, 5th, 6th, 7th, 11th, 12th, 13th, 26th to 29th, at sunset. Olympia, 28th, at sunset.

SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for February, 1884:

Date—Feb., 1884.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 9 a. m...	3	20‡	.....	.....	.....	.....	7	50‡	
2, 10 a. m...	0	0	0	5‡	0	0	7	45‡	Faculæ abundant.
3, 12 m.....	1	25‡	2	12‡	1	2	6	60‡	
10, 2 p. m...	3	10‡	.....	.....	.....	.....	7	25‡	
15, 2 p. m.	.....	.....	.....	.....	.....	.....	6	35‡	
16, 10 a. m.	1	2	1	1	1	2	6	35‡	
20, 2 p. m...	.....	.....	.....	.....	.....	.....	5	30‡	
21, 12 m.....	1	2	1	3	1	2	5	30‡	
22, 1 p. m...	0	0	1	2	0	0	4	25‡	
24, 12 m.....	2	10‡	0	5‡	2	10‡	6	30‡	
25, 3 p. m...	1	15‡	0	0	1	5‡	7	45‡	

Faculæ were seen at the time of every observation. ‡Approximated.

Mr. H. D. Gowey, of North Lewisburg, Ohio, reports that sun-spots were observed on all clear days during the month.

SUNSETS.

The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from one hundred and fifty-four stations show 4,271 observations to have been made, of which six were reported doubtful; of the remainder, 4,265, there were 3,787, or 88.8 per cent., followed by the expected weather.

EARTHQUAKE.

The following communication was published in the Saint Louis "Globe-Democrat," of February 20, 1884:

To the editor of the "Globe-Democrat":

CALEDONIA, MISSOURI, *February* 19, 1884.—I have seen no mention in the public prints of a slight earthquake shock that was felt at this point on Friday, the 15th instant. About 6 a. m. of that day, before I had risen, I felt the house shaking as if there had been a heavy clap of thunder, the shingles rattled on the roof, and the walls creaked under the strain. As this continued two or three seconds, I had time to find out that it was not thunder, nor any concussion inside the house; so, concluding that it was an earthquake, I prepared to observe its phenomena, but the shock was over before I could record any very marked features of its movement. The heaving motion of the earth was very perceptible, however, and the character of the shock was at once suspected by all who felt it. It was felt at a point four miles south of this, but seems to have occasioned little comment. Those who were in the second stories of houses felt the shock more perceptibly than those on the ground floors. Very truly, R. F. CHEW.

METEORS.

Captain Morgan, of the British s. s. "Egyptian Monarch," which arrived at New York, February 25th, from London, states that on February 12th (near N. 49° 30′, W. 15° 0′), about 10 a. m., a meteor burst over his vessel, apparently about ten feet above the bridge, giving a terrific report and strong sulphurous smell.

Yuma, Arizona.—A meteor was observed in the southwestern sky at 4.28 a. m. of the 24th, and left a bright trail.

Clarksville, Red River county, Texas.—A large meteor was observed at 4. m. of the 25th, passing in a direction from southwest to northeast and exploding with a loud report when near the earth.

Meteors were also observed on the several dates, as follows:
1st.—Vermillion, Dakota; Crete, Nebraska.
14th.—Davenport, Iowa.
20th.—Woodstock, Maryland; Austin, Texas; Variety Mills, Virginia.
21st.—Woodstock, Maryland; Menand Station (near Albany), New York.
22d.—Allison, Kansas; Davenport, Iowa.
25th.—Red Willow, Nebraska.
28th.—Auburn, Alabama.

ZODIACAL LIGHT.

Prescott, Arizona, 20th, 21st, 22d, 27th, 28th, 29th.
Archer, Florida, 2d, 26th.
Cresco, Iowa, 16th.
Allison, Kansas, 20th, 22d, 24th.
Yates Centre, Kansas, 19th, 20th, 24th, 25th, 28th.
Cambridge, Massachusetts, 15th, 20th, 24th.
Somerset, Massachusetts, 15th, 16th, 20th, 29th.
Mazatlan, Mexico, 28th.
Escanaba, Michigan, 1st, 7th, 20th, 23d.
Syracuse, New York, 21st.
Chapel Hill, North Carolina, 20th, 23d, 28th.
Albany, Oregon, 27th.
Stateburg, South Carolina, 18th, 21st, 28th.
Nashville, Tennessee, 15th, 18th, 25th.
Variety Mills, Virginia, 15th, 18th, 20th, 21st, 24th, 25th, 26th, 28th.
Sussex, Wisconsin, 21st.

POLAR BANDS.

Lead Hill, Arkansas, 14th, 18th, 19th, 20th.
Archer, Florida, 2d, 15th, 23d, 28th, 29th.
Riley, Illinois, 15th.
Guttenberg, Iowa, 24th.
Yates Centre, Kansas, 1st, 20th.
Portland, Maine, 21st.
Escanaba, Michigan, 10th.
Clear Creek, Nebraska, 20th, 21st.
Johnson, Nebraska, 29th.
Moorestown, New Jersey, 14th.
Rochester, New York, 16th.
Wauseon, Ohio, 3d, 14th, 16th, 29th.
Troy, Pennsylvania, 14th.
Block Island, Rhode Island, 3d.
Nashville, Tennessee, 25th.
Rio Grande City, Texas, 13th, 18th.
Wytheville, Virginia, 5th.

MIGRATION OF BIRDS.

Geese flying northward.—Swanwick, Illinois, 2d; Elk Falls, Kansas, 7th, 20th; Holton, Kansas, 1st; Leavenworth, Kansas, 23d, 24th; West Leavenworth, Kansas, 22d; Yates Centre, Kansas, 23d; Liberty Hill, Louisiana, 5th; Shreveport, Louisiana, 26th; Clear Creek, Nebraska, 2d, 24th, 26th; Garrettsville, Ohio, 19th; Troy, Pennsylvania, 25th; Ashwood, Tennessee, 11th; Fort Myer, Virginia, 22d; Variety Mills, Virginia, 11th. *Flying southward.*—Edgington, Illinois, 25th; New River Inlet, North Carolina, 14th; Fort Myer, Virginia, 25th; Cape Henry, Virginia, 19th. *Flying westward.*—Griffin Station, Indiana, 12th; West Leavenworth, Kansas, 22d. Geese appeared at Golden, Colorado, on the 18th.

Ducks flying northward.—Fort Smith, Arkansas, 17th; Swanwick, Illinois, 2d; Griffin Station, Indiana, 9th; Yates Centre, Kansas, 3d, 25th; Fort Scott, Kansas, 13th; Clear Creek, Nebraska, 26th; Moorestown, New Jersey, 16th; Chambersburg, Pennsylvania, 22d; Narragansett Pier, Rhode Island, 19th; Indianola, Texas, 1st. *Flying southward.*—Fort Smith, Arkansas, 19th; Red Willow, Nebraska, 23d; Oswego, New York, 24th. *Flying eastward.*—Yates Centre, Kansas, 23d.

Flying westward.—Griffin Station, Indiana, 12th; Guttenburg, Iowa, 11th, 26th; Yates Centre, Kansas, 24th.

Brents flying northward.—Indianola, Texas, 1st; West Leavenworth, Kansas, 26th.

PRAIRIE AND FOREST FIRES.

Galveston, Texas.—Reports from Temple, Bell county, state that on the morning of the 23d an extensive fire was raging among the cedars at the falls on Leon river, which threatened to destroy the greater part of the timber in that section.

Limona, Hillsborough county, Florida.—From the 7th to 10th the atmosphere was filled with smoke from forest fires. Much fencing and grass and many trees were destroyed.

Andersonville, Sumter county, Georgia.—On the 11th the atmosphere was filled with smoke from forest fires.

Fort Smith, Arkansas, 29th.

Cedar Keys, Florida, 10th.

Cantonment, Indian Territory, 28th.

Fort Stockton, Texas, 17th, 18th, 26th.

Indianola, Texas, 15th, 24th, 25th, 26th.

DROUGHT.

Reports from Pensacola, Florida, on the 13th, stated that rain was much needed in that vicinity. The interests most affected by the drought were those of the lumber dealers, who were unable to float their stocks of logs to the Gulf on account of the low stage of water in the neighboring streams.

WATER SPOUT.

On February 19th the schooner "Three Sisters," in N. 32° 52′, W. 78° 54′, was struck by a water spout which carried away main-gaff, mainsail, foresail, and mast-hoops, and flattened the after hatches.

NOTES AND EXTRACTS.

REPORT OF THE MISSOURI WEATHER SERVICE, FEBRUARY, 1884.

The mean temperature during February has been 34.6 at the Central Station, which is eight tenths of a degree below the average temperature of Saint Louis. In the last forty-seven years February has been colder than in the month of February last, eighteen times; the coldest February, that of 1838, being 20.7, or 13.9 degrees below that of February, 1884.

The lowest temperature reached during the month was 3°.0 at the Central Station. This has been exceeded many times in previous years. On February 3d, 1856, the temperature fell to − 15°, and the next day it was —11°. The temperature has fallen to zero as late as March 3d (1848), and to 1°.0 as late as March 14th (in 1867). The opinion generally entertained that the weather of last month was unusually severe is always produced by normal winter weather.

In the state the lowest temperatures have been observed in the southern and western parts. The lowest were —12° at Phelps City; —8° at Oregon, —6° at Savannah; —5° at Carthage and Centreville. The lowest at Keokuk was 2°; at Saint Louis 3°; Mascoutah, Illinois 6°; and Cairo, Illinois 12°.

The rainfall has been heaviest (over six inches) in a narrow belt stretching southward from Centreville. From this area the fall diminishes with great regularity to one inch in the northwest part of the state. The rainfall at Saint Louis has been 3.88 inches, or 1.3 inches above the average. The principal rainfall of the month fell on the fourth and twelfth of the month and was accompanied with heavy thunder. The rivers in southern Missouri were all high during the middle of the month, and this aided in the destruction caused by the floods in the lower Mississippi.

The floods caused greatest destruction along the Ohio river, where the water was higher than ever before observed, as far down as Mound City. At Cairo, seven miles below Mound City, the water was half an inch below the high-water of 1882, and four inches below that of 1883.

The following notes are taken from the station reports:

Centreville: 5th, first thunder storm of the season last night; 19th, barometer down to 28.7, looks like a storm.

Glasgow: 19th, a strange day; at 7 warm and muddy, temperature 33°; at 9 snowing and freezing; at 12 frozen hard, temperature 18°; 14 hours, sun shining; 16 hours, clear.

Chamois: from 2 hours on the 4th to 22.30 hours on the 5th, 2.77 inches of rain fell; heavy thunder and rain on the 4th; 19th, from 7 to 14 hours the temperature fell 33 degrees.

Louisiana: 19th, temperature fell 20 degrees in two hours, this fall being preceded by a thunder storm at 8.30.

Depth of snow at the end of the month: Phelps City, nw.; Harrisonville, w.; Greenfield, sw.; Ironton, se.; Saint Louis, e.; Mexico, c., and Macon, ne.; none. In the central part of the state, Chamois reports 2 inches, Lexington 0.5, Boonville 2, and Centreville, se., 0.3. Note.—The abbreviations (nw., &c.) indicate the section of the state in which the station is located.

The snow fall was 6.5 inches at Oregon and Ironton; 5.8 at Chamois; 4.7 at Boonville; 3.5 at Macon and Lexington; 3 at Greenfield; 2 at Louisiana; 1.5 at Glasgow; and 1.2 at Miami and Harrisonville.

Robins appeared at Oregon on the 25th, and cat birds at Centreville on the 28th. The witch hazel was observed in bloom at Centreville on the 23d, and the first crocus bloomed on the 28th.

FRANCIS E. NIPHER, *Director.*

Washington University, March 10, 1884.

The following extract is taken from the February report of the "Tennessee Weather Service," Hon. A. J. McWhirter, director:

The meteorological conditions of the month were, taken altogether, rather anomalous. The most noted features were the storm of the 19th, the cold wave and low range of temperature on the 29th, and the continued cloudy and rainy weather, making, on the whole, perhaps the most gloomy and disagreeable February on record.

The average precipitation was 8.45 inches, or 1.90 inches greater than that of the previous month, and was considerably in excess of the February mean for a number of years. A small portion of this was in snow, and in hail in some localities. The rainfall was pretty well distributed throughout the month, and there was not more than one day absolutely free from rain or snow. The heaviest fall occurred from the 5th to the 10th, inclusive, the 13th, 19th, and 27th. The day on which the greatest quantity fell was the 7th, when the fall averaged 1.38 inches for the state. The mean depth of snowfall was 3.22 inches. The heaviest fall occurred on the 27th. One or two slight falls occurred previous.

The mean temperature was 45°, or 15°.55 above the mean for January. The highest temperature was about the 11–13th, the maximum being 74°, reported from Knoxville, and was the same as the January maximum. The lowest temperature was on the 29th, and was uniform. At one station, Beech Grove, as low as 6° below zero was reported.

The feature of the month was the storm that passed over the state on the 19th. This was severe at Dyersburg, Trenton, Milan, McKenzie, Huntingdon, Waverly, Savannah, Sailor's Rest, Franklin, Ashwood, Hurricane Switch, Hardison's Mills, Florence Station, Flat Creek, Alexandria, Riddleton, Smithville, Fostoria, and Grief. It was particularly severe in the vicinity of Clarksville, where the destruction to houses, fences, and timber was very great. It was also destructive in some of the central counties of the middle division. The course of the storm was from the southwest, the wind changing in a few minutes from south to southwest, west and northwest to north, and followed by a rapid fall in temperature. The wind was accompanied by hail in many places, and snow in some. There was also quite a severe storm of wind and rain on the 12th at Huntingdon, McKenzie, and Parksville; one on the 13th at Grief, Maryville, and Hardison's Mills, and one on the 14th at Flippin and Andersonville. These were destructive to fencing and timber.

* * * * * *

The Commissioner again urges upon voluntary observers the importance of making their records full and complete. This is especially requested in the item of daily rainfall, in order to make the table of precipitation accurate. It is to be a feature of future reports, and it is earnestly desired that it shall be a record of reliable data.

The following extract is taken from the report of Prof. T. C. Mendenhall, director of the "Ohio Meteorological Bureau:"

The mean temperature for the month was more than three degrees higher this year than last, and the minimum was not as low by about four degrees, nor was the maximum as high by about six degrees.

While the range for the month was thus considerably smaller than for February of last year, the mean daily range was almost exactly the same. In fact, in the matter of temperature, the month differed but little from the corresponding period of last year.

Unfortunately the similarity did not exist in temperature alone, but in rainfall the extraordinary conditions of February last year were closely repeated and, indeed, somewhat exceeded. Although the mean rainfall for the whole state was somewhat less than that of February, 1883, being 5.52 inches against 6.49 inches for that month, the precipitation in the southern portion of the state was greater than at that time. Thus at Cincinnati the rainfall in February, 1883, was 8.22 inches, while during February, 1884, it was 8.87 inches.

The minimum rainfall observed for the month in 1883 was 4.10 inches at Sandusky, while for the same month in 1884 it was 3.03 inches in Toledo. The heavy precipitation was more localized in 1884 than in 1883. The existence of a large amount of snow, covering a frozen soil, conspired with this heavy rainfall to bring about a repetition of the disastrous floods of last year, those of the present year, however, far exceeding the floods of 1883 in magnitude and in the destruction of property. At Cincinnati the Ohio river reached its highest point on February 14, the gauge showing 71 feet, ⅜ inch, and it is worthy of note that the maximum was reached on the day following the anniversary of the maximum of last year.

The overflow of the upper Ohio was much greater this year than last. In foot-notes to some of the station reports will be found recorded the dates on which the river reached its maximum stage.

In this connection it will be interesting to note the rainfall as recorded at the seven stations nearest the Ohio river. The records were as follows: